Title: Finelli and Company Catering

Brief Overview:

In this unit, students will be able to identify, create, and extend patterns. They will solve real life problems by using a function table.

NCTM 2000 Principles for School Mathematics:

- ***Equity:*** *Excellence in mathematics education requires equity - high expectations and strong support for all students.*

- ***Curriculum:*** *A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades.*

- ***Teaching:*** *Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.*

- ***Learning:*** *Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.*

- ***Assessment:*** *Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.*

- ***Technology:*** *Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.*

Links to NCTM 2000 Standards:

- ***Content Standards***

<u>Number and Operations</u>

- *Understand number, ways of representing numbers, relationships among number, and number systems.*
- *Understand meanings of operations and how they relate to one another.*
- *Compute fluently.*

<u>Algebra</u>

- *Understand patterns, relations and functions.*
- *Discover patterns in the real world.*
- *Find patterns using a function table.*
- *Use mathematical models to represent and understand quantitative relationships.*

Problem Solving

- *Apply a variety of strategies to solve problems involving patterns and models.*
- *Solve problems that arise in mathematics and in real life.*
- *Monitor and reflect on the process of mathematical problem solving*

Communication

- *Organize and consolidate their mathematical thinking through communication.*
- *Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.*

Connections

- *Recognize and use connections among mathematical ideas.*
- *Understand how mathematical ideas interconnect outside of mathematics.*
- *Recognize and apply mathematics in contexts outside of mathematics.*

Grade/Level:

3rd-5th Grade

Duration/Length:

This lesson will take four 40-minute periods.

Prerequisite Knowledge:

- *Basic understanding of shapes*
- *Basic pattern recognition*

Student Outcomes:

Students will be able to:

- *Learn what a pattern is.*
- *Create patterns.*
- *Extend a pattern.*
- *Learn what a function table is and how to use it.*
- *Name pattern rules and relationship.*
- *Learn and practice problem-solving skills.*
- *Work in cooperative learning groups.*

Materials/Resources/Printed Materials:

- *Red, green, and blue construction paper cut into quarters (napkins). 4 quarters of each color for each student.*
- *Red, green, and blue construction paper cut into circles using the pattern on Student Resource Answer Sheet # 1. 4 circles per color per student*
- *The Paper Crane by Molly Bang*
- *Pencils*
- *Overhead projector*
- *Scissors*
- *Napkins*
- *Sentence strips*
- *Teacher Resource Sheets*
- *Student Resource Sheets*
- *Glue*
- *Graph paper*

Development/Procedures:

Day 1

1. *Show examples of patterns- wallpaper, flags, towels, etc.*
2. *Read the book, The Paper Crane, by Molly Bang to introduce the restaurant/catering idea.*
3. *Introduce catering. What is it? What do caters do? Why do they do it? How do they do it? What do they need?*
4. *Introduce pattern types- ABC, AAB, AABC. Use Teacher Resource Sheets # 1-3. Laminate if needed.*
5. *Distribute napkins and on the overhead write and explain the problem. What color combinations can Finelli and Co. use for their upcoming graduation party?*
6. *Discuss solutions the students discovered.*
7. *Introduce math vocabulary. See Teacher Resource Sheet # 4.*
8. *Reflect- What is pattern? What did you learn about patterns today?*
9. *Homework- Find 4 patterns in and around your house. Write or draw them and be ready to discuss them tomorrow.*

Day 2

1. *Review math terms learned yesterday. Ask students what the words term, core, pattern, and rule mean.*
2. *Distribute Student Resource Sheet # 1. Using overhead projector, write and explain catering problem using plates. There will be a wide variety of answers.*
3. *Explain rubric - Teacher Resource Sheet # 5.*
4. *Have students glue their pattern on to sentence strips and label (AABC, ABCB, etc) the pattern on the back. The sentence strip pattern should*

contain at least three terms of the pattern. Encourage students to come up with new patterns combinations.

5. *Have students pass the patterns to another student, so they can decipher the pattern.*
6. *Discuss the combinations the students discovered.*
7. *Have students write in their journals - What is a term? What is a core?*

Day 3

1. *Distribute Student Resource Sheet # 2.*
2. *On the overhead, introduce the problem and the concept of using a function table to solve the problem. Ask questions while doing the activity so students are able to get a basic idea of how a table works.*
3. *Explain and introduce the table design problem on Student Resource Sheet # 3.*
4. *Working in groups, have student complete this worksheet.*
5. *Discuss - Is there more than one way to solve this problem?*
6. *Distribute Student Resource Sheet # 4 with the extension problem.*
7. *Working in groups, have students do the first problem.*
8. *Discuss the results.*
9. *Reflect – What is a function table? How did the concept of the function table help or hinder your effort?*
10. *Homework – Distribute Student Resource Sheet # 5.*

Day 4

1. *Discuss the homework. Did any students have any problems?*
2. *Distribute Student Resource Sheet # 6.*
3. *On the overhead, introduce the problem.*
4. *Working in groups, students should complete the first part of the sheet.*
5. *Discuss how the students found the rule for the function table.*
6. *Distribute graph paper to each student and have him or her complete the worksheet. They can work in groups or individually.*
7. *Discuss what the graph shows.*
8. *Reflect-What strategies did you use to solve the problem today?*

Performance Assessment:

Through daily observations and explanations on the worksheets, teachers should be able to assess the student's understanding of pattern and function tables. The final assessment is a problem-solving situation using Student Resource Sheet # 7.

Extension/Follow Up:

- *Using problem 3, have student graph the exercise. Have students graph the ordered pairs, connect them, and predict the 12^{th} ordered pair from the graph.*
- *Have students graph the patterns using several different graphing methods.*
- *Continue the study of patterns with Pascal's Triangle or Fibonacci's Numbers.*

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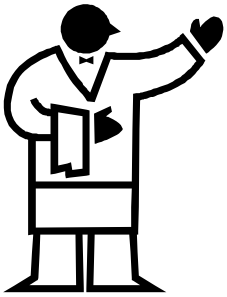


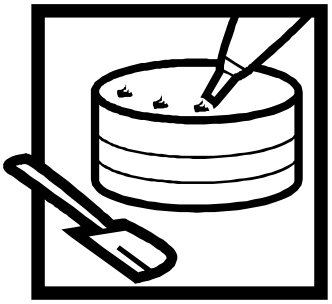
What Color Plates Should We Use?

Mrs. Finelli has twice as many blue plates as green and red plates. What possible combinations could she use for an up-coming party?

Put one core pattern that you discovered on the sentence strip.

If you continued this combination, what color would the 69th plate be? _____

Explain your answer.



How Many Balloons Do We Need?

The caterer, Mr. Finelli, had three birthday parties last week. For the first party, he used 5 balloons, for the second party, he used 9 balloons, and for the third party, he used 13 balloons. If the same pattern continues, how many balloons will the caterer use for the:

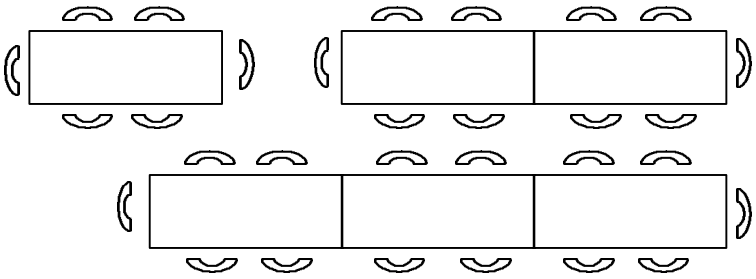
7^{th} party? _____

12^{th} party? _____

60^{th} party? _____

What is the rule for the pattern?

How did you get your answer?



How Many Tables Should We Use?

Mr. Finelli is using these tables and putting chairs around them.

Tables	Chairs
1	6
2	10
3	

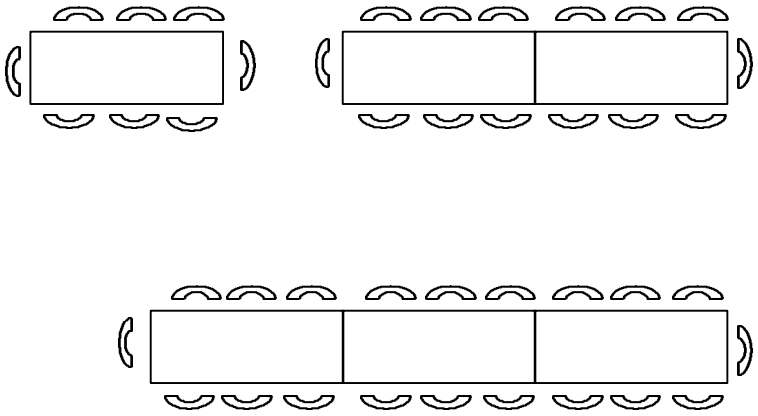
Based on the table seating above, how many chairs will be needed if Mr. Finelli needs:

5 tables? _____
12 tables? _____
20 tables? _____

Write a rule for telling the number of chairs Mr. Finelli needs if he knows the number of tables.

Explain your answer.

Student Resource Sheet # 4



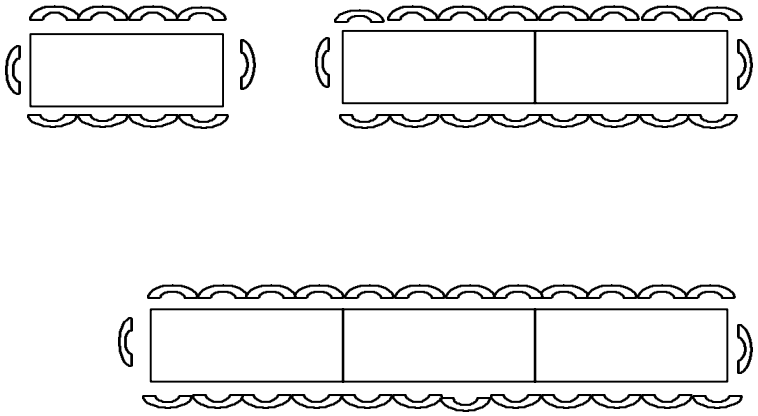
How Many Chairs Should We Use?

More people will be attending the Smith graduation Party than planned. If more tables are being used, how many chairs will be needed for the table seating pattern pictured above, if the party requires:

7 tables? _____
10 tables? _____
15 tables? _____

Write a rule for telling the number of chairs Mrs. Finelli needs if she knows the number of tables.

Student Resource Sheet # 5



How Many Chairs Should We Use?

More people will be attending the Garcia wedding than planned. If more tables are needed, how many chairs will need to be added, for the table seating pattern pictured above, if the party requires:

9 tables? _____
14 tables? _____
19 tables? _____

Write a rule for telling the number of chairs Mrs. Finelli needs if she knows the number of tables.

Student Resource Sheet # 6

We Need More Business

Mrs. Finelli wants to increase their business, but they do not want to spend money on advertising, so they are letting their parties do their talking, hoping that with each party they have some new business. The table below illustrates their progress.

# Of Parties	# Of New Parties
5	1
10	2
15	
20	
	5
	6
	7
40	
	9

Some coffee has been spilt on Mrs. Finelli's records. Can you help her complete her information?

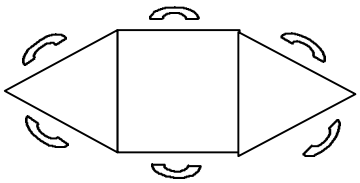
1. Complete the records.
2. Write the rule for finding the information.

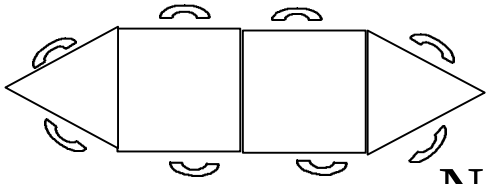
Explain your answer.

Using graph paper, plot the ordered pairs.

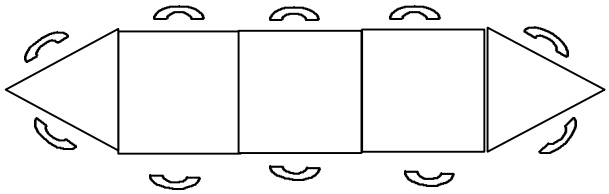
What does the graph show you?

Student Resource Sheet # 7





New Seating Arrangement??



Mr. Finelli is trying a new setting arrangement. He needs your help to figure out how many people he can seat for his upcoming party.

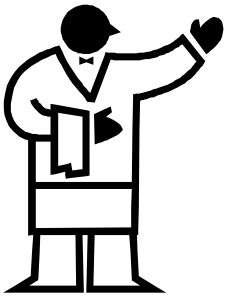
How many chairs will be needed if Mr. Finelli needs:

6 tables? _____
20 tables? _____
34 tables? _____

Write a rule for telling the number of chairs Mr. Finelli needs for the number of tables.

Explain your answer.

Student Resource Sheet # 1
(Answer Key)



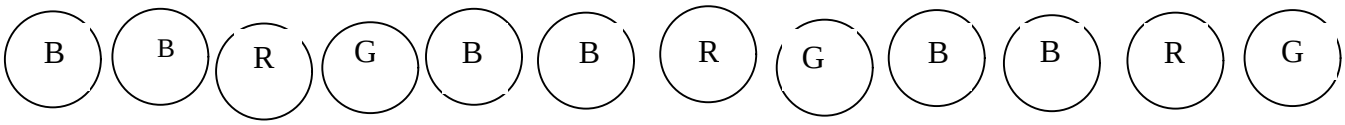
What Color Plates Should We Use?

Mrs. Finelli has twice as many blue plates as green and red plates. What possible combinations of plates could she use for an up-coming party?

Put one core pattern that you discovered on the sentence strip.

If you continued this combination, what color would the 69th plate be? Blue

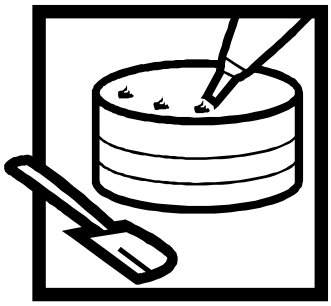
Explain your answer. Two possible answers are:
69/4 = 17 cores + 1 This is the location of the 69th term.



69/4 = 17 cores + 1 This is the location of the 69th term.

1	2	3	4	5	6	7	8	9	10	11	12
B	G	B	R	B	G	B	R	B	G	B	R

Student Resource Sheet # 2
(Answer Key)



How Many Balloons Do We Need?

The caterer, Mr. Finelli, had three birthday parties last week. For the first party, he used 5 balloons, for the second party, he used 9 balloons, and for the third party, he used 13 balloons. If the same pattern continues, how many balloons will the caterer use for the:

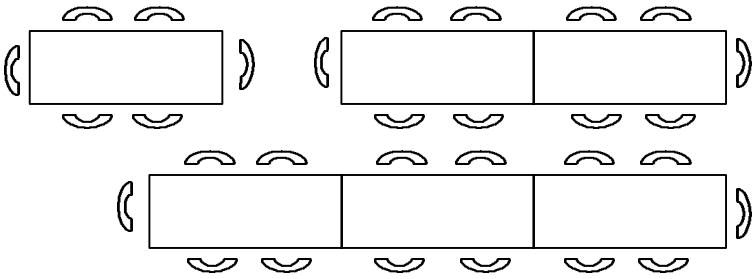
7^{th} party? _____29_____
12^{th} party? _____49____

60^{th} party? _____241_____

Party #	Balloons
1	5
2	9
3	13

What is the rule for the pattern?
(Party # x 4) + 1

How did you get your answer?



Student Resource Sheet # 3
(Answer Key)

How Many Tables Should We Use?

Mr. Finelli is using these tables and putting chairs around them.

Based on the table-seating pattern above, how many chairs will be needed if Mr. Finelli needs:

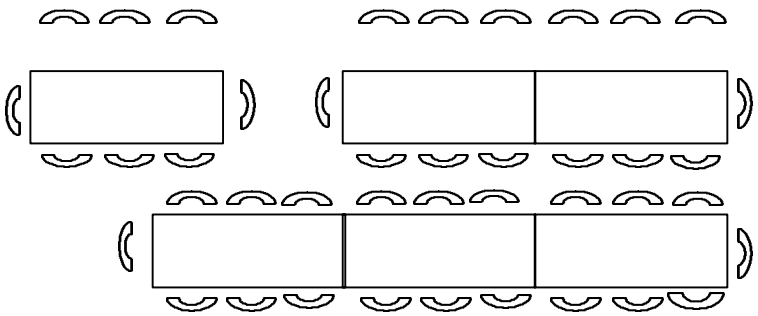
5 tables? 22
12 tables? 50
20 tables? 82

Write a rule for telling the number of chairs Mr. Finelli if he knows the number of tables.
(Tables x 4) + 2

Explain your answer.

Tables	Chairs
1	6
2	10
3	14

Student Resource Sheet 4
(Answer Key)



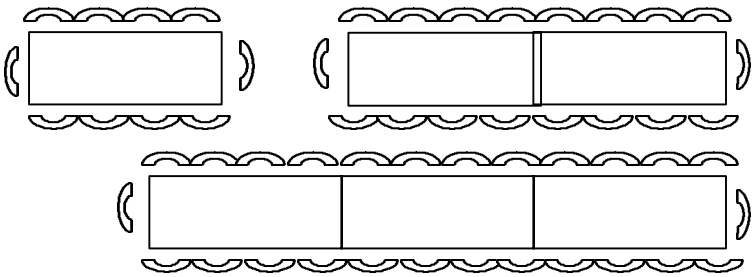
How Many Chairs Should We Use?

More people will be attending the Smith graduation Party than planned. If more tables are being used, how many chairs will be needed, for the table seating pattern pictured above, if the party requires:

7 tables? 44
10 tables? 62
15 tables? 92

Write a rule for telling the number of chairs Mrs. Finelli if she knows the number of tables.
(Tables X 6) + 2

Tables	Chairs
1	8
2	14
3	20



Student Resource Sheet # 5
(Answer Key)

How Many Chairs Should We Use?

More people will be attending the Garcia wedding than planned. If more tables are needed, how many chairs will need to be added, for the table seating pattern pictured above, if the party requires:

9 tables? 74
14 tables? 114
19 tables? 154

Write a rule for telling the number of chairs Mrs. Finelli needs if she knows the number of tables.

(Tables x 8) + 2

Tables	Chairs
1	10
2	18
3	26

Student Resource Sheet # 6
(Answer Key)

We Need More Business

Mrs. Finelli wants to increase their business, but they do not want to spend money on advertising, so they are letting their parties do their talking, hoping that with each party they have some new business. The table below illustrates their progress.

# Of Parties	# Of New Parties
5	1
10	2
15	3
20	4
25	5
30	6
35	7
40	8
45	9

Some coffee has been spilt on Mrs. Finelli's records. Can you help her complete her information?

1. Complete the records.
2. Write the rule for finding the information.

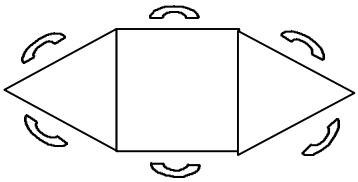
   # of Parties divided by 5 = the # of New Parties

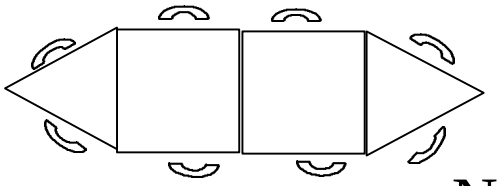
Explain your answer.

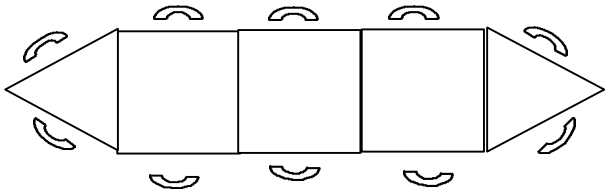
Using graph paper, plot the ordered pair.

What does the graph show you?
The business is increasing as the Finelli's have more parties.

Student Resource Sheet # 7
(Answer Key)







New Seating Arrangement??

Mr. Finelli is trying a new setting arrangement. He needs your help to figure out how many people he can seat for his upcoming party.

How many chairs will be needed if Mr. Finelli needs:

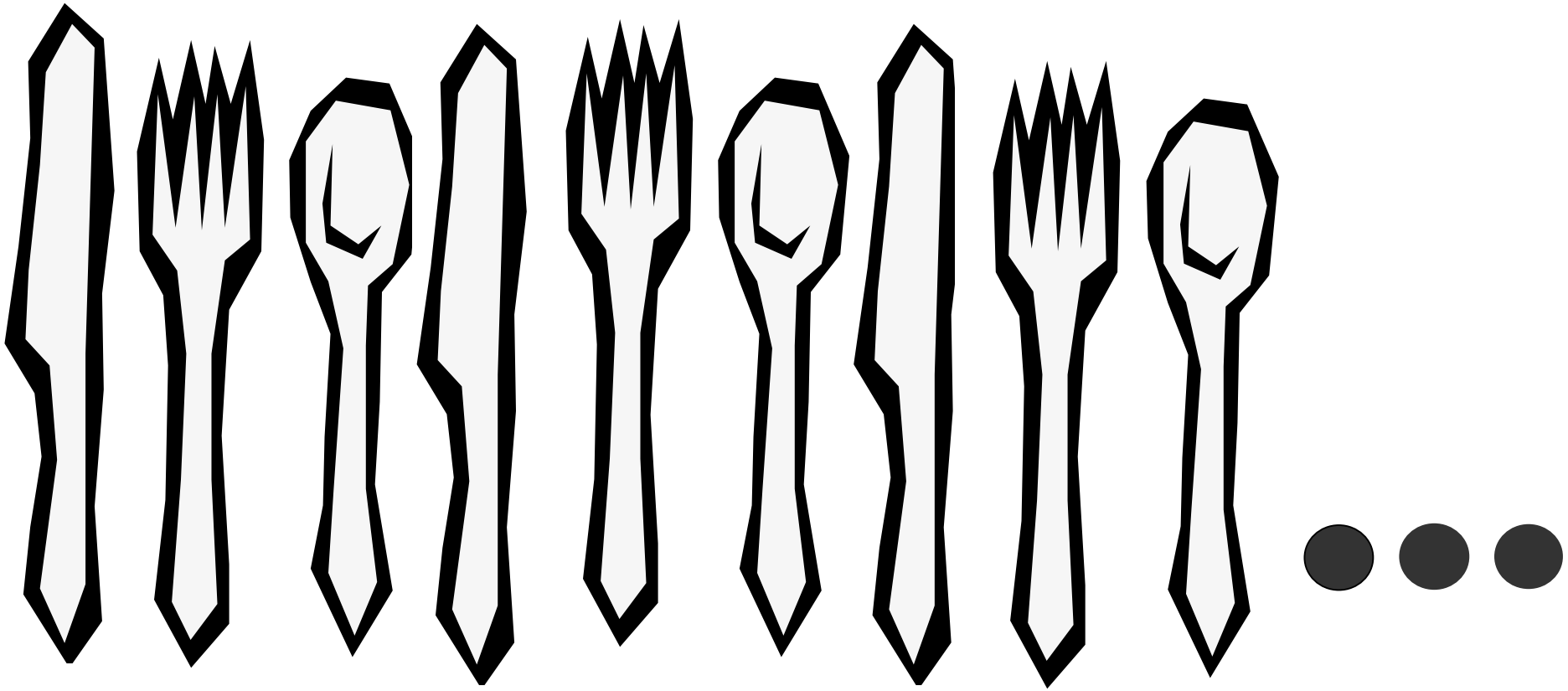
6 tables? 16
20 tables? 44
34 tables? 72

Write a rule for telling the number of chairs Mr. Finelli needs for the number of tables.
(tables x 2) + 4

Explain your answer.

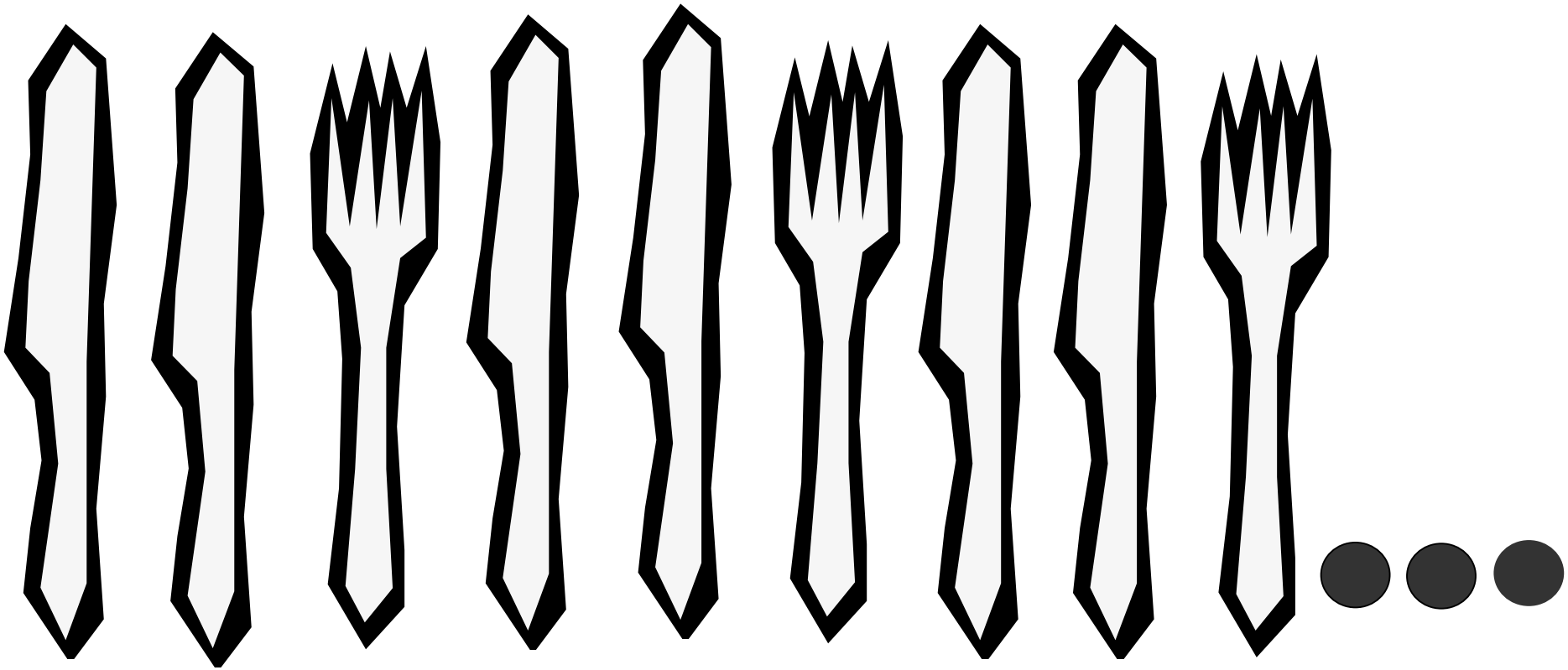
Tables	Chairs
1	6
2	8
3	10

PATTERN – ABC



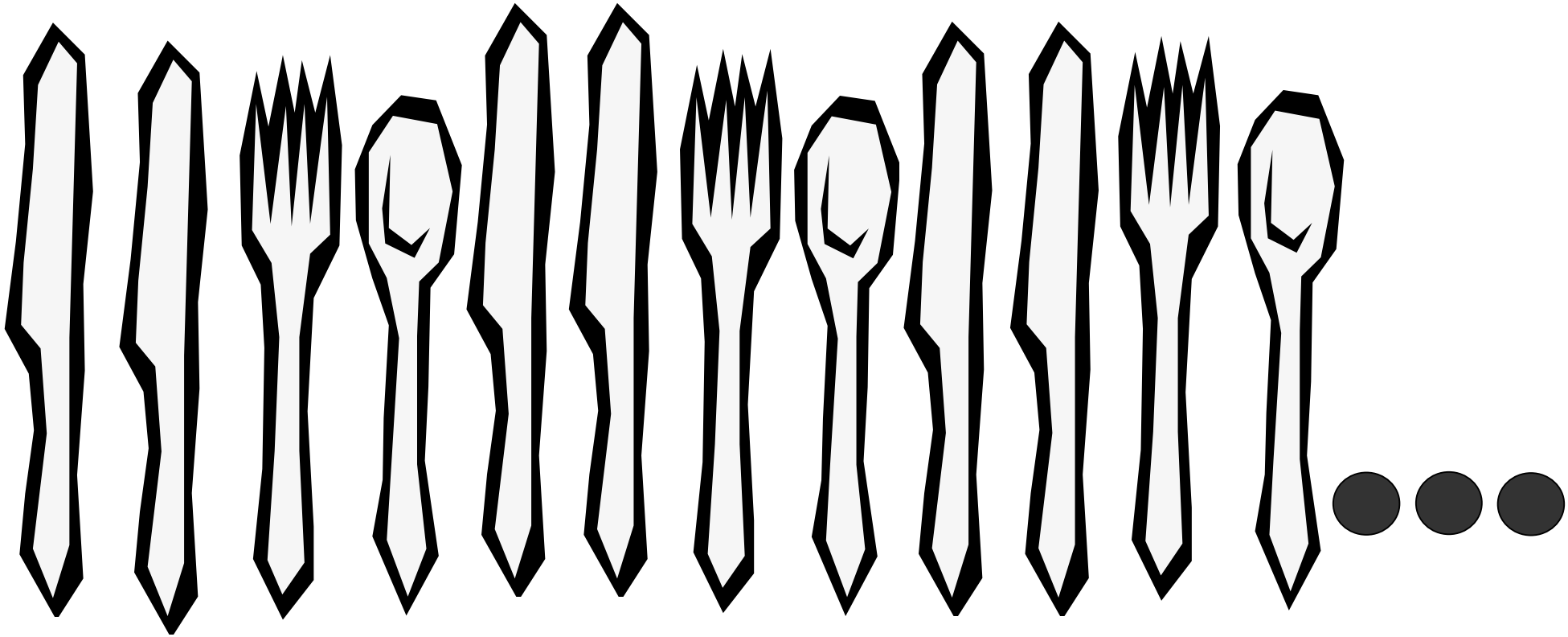
Teacher Resource Sheet # 2

Pattern - AAB



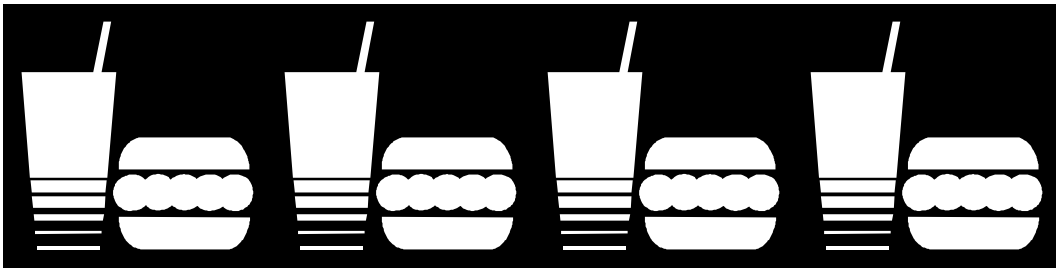
Teacher Resource Sheet # 3

Pattern - AABC



PATTERN MATH VOCABULARY

PATTERN - A pattern is a sequence of objects, numbers, color, etc. that repeats.



CORE – The core of a repeating pattern is the shortest string of elements that repeat.

FUNCTION – A set of ordered pairs such that for any first number (the input), there is only one possible second number (the output).

RELATIONSHIP- A relationship is a description of how a set of ordered pairs relate.

RULE – A rule is a description of the pattern

SEQUENCE- A set of numbers or objects arranged in a special order or pattern

TERM- A term is each place or position in the sequence. It should extend three more times when copied by a student.

Teacher Resource Sheet # 5

Mathematics rubric for Scoring Items

3 Point rubric

Level 3	The answer is correct and the written response shows a complete understanding to the solution of the problem.
Level 2	The response shows a satisfactory approach for solving the problem. It is not a complete answer, but you are on your way.
Level 1	The response indicates little attempt to apply a reasonable approach. It may or may not lead to a correct answer. The response demonstrates minimal understanding.
Level 0	The answer is completely incorrect or irrelevant. There may be no response or the response, “I don’t get it.”

Problem Solving Strategies

1. Patterns
2. Make/use a model
3. Make/ use a picture
4. Logical deduction
5. Guess and test
6. Make/and use a table
7. Make a/use an organized list
8. Work backwards
9. Solve a simpler problem
10. Make/use a diagram/picture
11. Write an equation

Pattern for Plates